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Community awareness, use and preference for pandemic influenza vaccines in Pune, India

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Keywords

Influenza, Pandemic, Vaccine uptake, Vaccine hesitancy, Mixed-methods, Community study, India

List of abbreviations

WHO: World Health Organization, IIV: Inactivated influenza vaccine, LAIV: Live attenuated influenza vaccine, FGD: Focus groups discussion, SSI: Semi-structured interview, IDI: In-depth interview, EMIC: Explanatory model interview catalogue, USA: United States of America

Abstract

Vaccination is a cornerstone of influenza prevention, but limited vaccine uptake was a problem worldwide during the 2009-2010 pandemic. Community acceptance of a vaccine is a critical determinant of its effectiveness, but studies have been confined to high-income countries. We conducted a cross-sectional, mixed-method study in urban and rural Pune, India in 2012-2013. Semi-structured explanatory model interviews were administered to community residents (n=436) to study awareness, experience and preference between available vaccines for pandemic influenza. Focus

group discussions and in-depth interviews complemented the survey. Awareness of pandemic influenza vaccines was low (25%). Some respondents did not consider vaccines relevant for adults, but nearly all (94.7%), when asked, believed that a vaccine would prevent swine flu. Reported vaccine uptake however was 8.3%. Main themes identified as reasons for uptake were having heard of a death from swine flu, health care provider recommendation or affiliation with the health system, influence of peers and information from media. Reasons for non-use were low perceived personal risk, problems with access and cost, inadequate information and a perceived lack of a government mandate endorsing influenza vaccines. A majority indicated a preference for injectable over nasal vaccines, especially in remote rural areas. Hesitancy from a lack of confidence in pandemic influenza vaccines appears to have been less of an issue than access, complacency and other sociocultural considerations. Recent influenza outbreaks in 2015 highlight a need to reconsider policy for routine influenza vaccination while paying attention to sociocultural factors and community preferences for effective vaccine action.

Introduction

Vaccination is a critical tool for controlling influenza. When faced with a pandemic, swift deployment of vaccines is crucial to limiting spread of the disease before the virus acquires increased pathogenicity or antiviral resistance.¹ On 11 June 2009, the World Health Organization (WHO) declared a global influenza pandemic caused by a novel influenza A (H1N1) virus.² Efforts were made to ensure adequate supply of vaccines. Yet, lower-than-anticipated uptake of the vaccine was a notable problem, even among high risk groups.³⁻⁷ Studies exploring vaccine hesitancy and reasons for poor uptake that limit effectiveness of a pandemic response have been largely restricted to high-income settings.⁸⁻¹¹ Despite acknowledged cross-cultural differences in public response to pandemic influenza and need for country-specific studies,^{12,13} few have been conducted in lower income settings.

A large burden of 2009 H1N1 influenza was borne by low-income countries.^{14,15} India reported 39,977 cases and 2,113 deaths from H1N1 influenza between May 2009 and August 2010.¹⁶ These numbers, which refer to laboratory-confirmed cases, are likely underestimated. The city of Pune, which suffered high morbidity and mortality,¹⁷⁻¹⁹ is incidentally home to a large vaccine manufacturer, Serum Institute of India Ltd. Inactivated influenza vaccine (IIV, injectable administration) and live attenuated influenza vaccine (LAIV, nasal administration) were available for public purchase in Pune during the 2009 pandemic.²⁰ While IIVs alone are licensed for certain groups (children under 2 years, persons 50 years and above and pregnant women), both types of vaccines are considered efficacious and safe for the larger population.²¹⁻²⁷

Demand for vaccines varied widely in India. In some cases, influenza vaccines were eagerly sought^{28,29} but at other times there were few takers.^{30,31} This variability highlights the importance of understanding community acceptance and facilitators and barriers for vaccine uptake. Although nasally administered LAIV is generally considered less invasive than IIV by health professionals, and it was available at a lower cost than IIVs in Pune, it is nonetheless a relatively new form of vaccine administration in India and questions arise about its community acceptability for influenza vaccination. Addressing questions about community preferences for one or other vaccine is likely to contribute to our understanding of vaccine hesitancy or confidence in their sociocultural context, which are critical determinants of effective influenza vaccine action.

Acknowledging sociocultural differences and differences in access to health services in urban and rural communities, we conducted a mixed-method study in low-resource and middle-income urban areas, and in accessible and remote rural areas of Pune, India.³² The first part of the study exploring community understanding and experience of pandemic influenza has recently been reported.³³ In this paper, we focus on the community-perceived role of vaccines with the objectives of (a) determining community awareness and views of pandemic influenza vaccination, (b) analysing experience and reasons for vaccination or non-vaccination against H1N1 influenza during the 2009 pandemic and (c) clarifying community perceptions and preferences for either injectable or nasal influenza vaccines. A review of experience and community perceptions of vaccines for pandemic influenza in India provides

a unique opportunity to inform planning for other immunization initiatives and recurring influenza outbreaks.

Results

Sample characteristics

Focus groups discussions (FGDs) were conducted in July 2012, semi-structured interviews (SSIs) from August to December 2012 and in-depth interviews (IDIs) between March and April 2013. Five FGDs (each with 5-6 participants), 12 IDIs and 436 SSIs have been analysed (Table 1). Among SSI respondents, those from the urban sites had received more education and had higher incomes; more details have been reported elsewhere.³³

Awareness of vaccines: in general and for pandemic influenza

Awareness of the role of vaccines in preventing illnesses was noted: *"A vaccine is given for prevention of an illness which we may get in the future"* (man, rural FGD). However, confusion about the preventive versus curative aspect of vaccines was also noted among some respondents. For example, a 65-year-old rural woman stated: *"[By taking the vaccine] the illness could have been prevented and she would have got cured"* (SSI).

Vaccines were sometimes distinguished by their mode of delivery. *"It is an injection and it has medicine in it"* (27 years, rural woman, IDI). They were also explained by terms appropriate for other vaccines that respondents were familiar with. A woman during a FGD in a rural area explained her idea of a vaccine by stating: *"We call it dose - triple, polio"*.

Some respondents thought vaccines were relevant only for children and expressed concern about their use for adults. *"All children are vaccinated. But adults are not vaccinated. I think the vaccine is effective for ages 1 to 5. We don't have experience with vaccines being effective at later ages"* (man, rural FGD).

Over a quarter of respondents said they were aware of a vaccine administered as a nasal spray for swine flu (Table 2). There was a significant difference in awareness based on age group (the younger age group of 18-45 years had higher awareness than the older age group of 46-65 years) and area of residence, with highest awareness in the urban middle-income area (47.1%) and lowest in the rural remote area (8.3%). Slightly fewer respondents (23.4%) reported awareness of an injectable vaccine to prevent swine flu.

When respondents were asked whether they had received advice regarding vaccines for swine flu from their health care providers, 15.8% of respondents reported that they had (Table 2). A larger percentage of these respondents were from the younger age group and from the urban sites.

Views on benefits and problems with pandemic influenza vaccines

Respondents were asked whether they thought a vaccine could have prevented swine flu. Most (94.7%) said yes, and significantly more who said yes were from the younger age group (97.3%) compared to the older age group (92.0%, $p=0.017$).

An analysis of narratives indicated confidence and trust in vaccines by a large percentage of respondents. A 47-year-old man who was confident of the benefits of a pandemic influenza vaccine

stated: “[If he had taken the vaccine] he would have been protected. Swine flu can happen only to those who have not taken the vaccine” (rural SSI). A few raised concerns about the efficacy of pandemic influenza vaccines, while maintaining their support of vaccines in general. For example, an urban woman said:

Getting vaccinated is definitely a good thing but I am not sure whether this vaccine is a proven one like other vaccines. I knew 100 percent about the vaccines that were given in early times but is there any data available for this new vaccine which proves that those who have taken it have not got swine flu? If someone asks me to take it, I won't deny. I would believe in it and would go for it (45 years, SSI).

Some who thought reported vaccines were helpful nevertheless had a fatalistic attitude towards the illness that did not preclude the vaccine. A 57-year-old urban woman explained: “The illness will happen anyhow if it has to happen but there is no harm in taking the vaccine” (SSI).

Others, however, suggested that destiny made any precaution including vaccines irrelevant: “It will happen if it is destined to happen even if she maintains cleanliness or takes any other precaution” (56 yr, woman, rural SSI). Very few distrusted the vaccine itself or had serious safety concerns.

Respondents were also specifically asked whether they knew of any problems with either the nasal or injectable pandemic influenza vaccines. Almost half (48.2%) said that nasal vaccines did not cause any problems and a majority (56.7%) said the same about injectable vaccines. Men were more likely than women to say there was no problem with pandemic influenza vaccines, and that perception was applicable to both nasal (57.7% men, 38.9% women, $p < 0.001$) and injectable (65.1% men, 48.4% women, $p < 0.001$) vaccines. A third of respondents were unable to say whether nasal or injectable vaccines caused any problems. The main anticipated problems for the nasal vaccine were discomfort or irritation in the nose and throat (12.8%) and runny nose or sneezing (4.4%). For injectable vaccines, identified problems included pain or swelling (8.9%) and fever or chills (3.7%). Only one person anticipated a serious adverse effect of the vaccines, and this person who lived in the urban low-resource area, said death might result from receiving the vaccine.

Experience with pandemic influenza vaccines

Of the 436 SSI respondents, 8.3% reported having personally received a pandemic influenza vaccine and 10.6% said someone else in their household had taken it (Table 2). The urban middle-income area had the highest proportion of vaccine acceptors, while the remote rural area had the lowest proportion. The more accessible rural area had more vaccine acceptors than the low-resource urban area.

Reasons for vaccine use

Narratives of those who had indicated household experience with the pandemic influenza vaccine (either personal use or someone else in the household who received it), were analysed to identify key reasons for vaccine uptake. Salience, social and medical influences, and the influence of media were discussed.

Salience of pandemic influenza: exposure to serious a swine flu-related illness or death

The decision to vaccinate for pandemic influenza was strongly motivated by having seen someone suffer from the illness or having heard of a death from swine flu. A 31-year-old urban woman explained: *"My sister's colleague's son suffered from it. He is alive but his friend who used to play with him died. When I heard about this, I became seriously concerned and I vaccinated my son"* (IDI). A rural woman who had taken the vaccine explained that fear drove her to action after a pregnant woman in her village had died from swine flu:

After one lady died and my son had swine flu, everyone was scared. They felt that if this continues, everyone in the village would die. Nobody from the government came here so members of a youth group called a private doctor so that our villagers would get the vaccine (45 years, IDI).

She also recounted her experience at the hospital while caring for her son with suspected swine flu illness as follows:

I observed that when a person was admitted with breathlessness, that person would die immediately. Yes, I have seen such people in Sassoon hospital. Once the person was taken inside the ICU, only their dead body would come out. People were therefore preoccupied with fear.

Social influence

Conduct of free vaccination camps in one's neighbourhood or at school were reported as reasons for taking the vaccine. In a village where a vaccination camp was conducted, peer effects seemed to motivate vaccine uptake. A 45-year-old rural woman explained: *"Everyone in the village took the vaccine, so I also took it to prevent anything before it happens"* (IDI).

Medical influence

Recommendation by a health care provider in the family influenced vaccine uptake for some. An urban woman explained her reasons for taking the vaccine as follows: *"The epidemic was at a peak and my nephew is a doctor. He was giving the vaccine to his friends and relatives. He is our close relative and we trust that he will not cheat us."* (65 yr, IDI). Other connections with the health system, such as working in a hospital, also influenced vaccine uptake. An urban woman said: *"I took the vaccine. I work as a security guard in a private hospital. It was given free of cost in our hospital."* (33 yr, SS/I)

Influence of media

Information from media reports was an important factor for people who actively sought the vaccine. An urban man explained: *"When I read the newspapers, I understood its seriousness, and thought that I should not waste time and therefore took the vaccine immediately"* (64 yr, IDI). But they acknowledged the importance of information on where they could get vaccinated from pamphlets provided by the Pune Municipal Corporation or volunteers who came door-to-door. However, it was often noted that while the media was a useful source of information, doctors were consulted before taking the vaccine: *"The media was discussing availability of vaccines. But we didn't rely on the media, we always consulted doctors"* (37 yr, urban IDI).

Reasons for vaccine non-use

When SSI-respondents were asked why they or anyone in their household had not taken the vaccine for swine flu, several common reasons were reported (Table 3).

Low perceived risk

A majority (55.0%) indicated low risk attributed to influenza or a sense that they were not personally at risk. Men were more likely to say that than women. Common accounts referred to the following points: First, if there were no cases of swine flu in the respondent's neighbourhood, a vaccine seemed unnecessary. In the urban areas, this was explained largely in terms of a lack of observable symptomatic cases in the neighbourhood: *"If somebody from our housing society gets swine flu, then I would go and take it. If there are no such cases around, then why should I take the vaccine?"* (57 yr, urban woman, IDI). Similar explanations were noted in the rural area, but complemented by assertions that swine flu was an urban problem that had not reached rural areas. A readily apparent epidemic was required to convince people of the salience of the illness. A man articulated this sentiment metaphorically: *"Suppose, there is a violent and rampant dog biting everyone, only then will a concerted effort be made to kill him. Similarly, in the absence of an epidemic, people will not take the vaccine."* (rural FGD). Second, the respondent's idea that personal strength and good health would confer protection from illness was mainly reported by men. For example: *"We don't need the vaccine. I am physically fit, I am a sportsman; mostly we won't get it"* (26 yr, rural man, SSI). Women frequently referred to reduced chances of contracting the illness because they stayed at home: *"Men are exposed to the outside, but we are always at home, hence we do not consider ourselves at risk of catching the illness"* (27 yr, urban woman, SSI). Faith in God as a basis for perceived protection was also mentioned. *"We believe in our god. We believed that we won't ever get swine flu, and we haven't"* (35 yr, urban man, SSI). Lastly a low priority for prevention, due to confidence in effective treatment was also noted: *"When there are illnesses in the rural areas, then a cure is made available there. Nobody takes prior care"* (25 yr, rural woman, SSI).

Other preventive measures make vaccines unnecessary

Adequacy of other preventive measures apart from vaccines was reported by 15.8% as a reason for not taking the vaccine, more so by urban than rural respondents ($p < 0.001$). Widely mentioned alternative preventive measures included the use of face masks (often referred to tying a handkerchief around the nose and mouth), maintaining personal hygiene, keeping surroundings clean and avoiding crowds. Some also referred to the use of preventive drugs, specifically mentioning antiviral drugs: *"We did not feel the need to take it since there were other things like masks and Tamiflu"* (24 yr, urban man, SSI). A few also mentioned herbal preventive measures: *"We used prevention measures – wearing a mask, using camphor and nilgiri [eucalyptus] oil. So, we did not feel the need to take the vaccine"* (33 yr, urban man, SSI). There was also infrequent mention of chanting of prayer and ritual purification ('agnihotra').

Lack of information about the vaccine

Some (11.7%) respondents were unaware of the existence of a vaccine against pandemic influenza. The largest proportion of such respondents was from the rural remote area, followed by the urban low-resource area and the lowest proportion was from the urban middle-income area. A rural woman explained: *"Two years ago when there was an outbreak of swine flu, we were not even aware*

that there was a vaccine for swine flu" (28 yr, SSI). This reason was often mentioned in combination with problematic access, i.e., not knowing where to obtain the vaccine.

Problems with access and cost

Difficulties relating to obtaining the pandemic influenza vaccine were noted by 14.7% of SSI respondents, with significantly more from rural than urban areas. The most frequently mentioned problem was that the vaccine was not delivered to the respondents' neighbourhoods. Rural respondents expected that important interventions would be delivered by government health workers. They were not sure how or where to get a vaccine if it was not brought to their villages. A rural woman explained why she did not take the vaccine as follows: *"The most important reason was that the vaccine did not come here, and we do not know where to go and get it" (35 yr, SSI).* Another problem for accessing the vaccine was not having a clinic nearby. A few respondents also noted the vaccine was available only for children and not adults. A 22-year-old woman who also drew a parallel with polio vaccine campaigns said: *"It hasn't come here yet. For children up to 5 years they come to give the polio vaccine. For swine flu also they came here to vaccinate children but not adults" (urban SSI).*

A few noted unavailability of the vaccine during the pandemic as a reason: *"There was no vaccine at that time when the illness more widespread. The vaccine came later" (46 yr, urban man, SSI).* Nine respondents indicated that they wished to take the vaccine but were unable to do so as it was out of stock due to high demand. Seven respondents said they had no time to spare to go and get the vaccine.

Financial constraints as a reason for not taking the vaccine were reported by 5%. Among these respondents, many stated that they would have taken it if the government had provided the vaccine for free or at a discounted price.

Insufficient indication of vaccine priority

Some respondents explained that health care providers, the government or people they knew had not clearly indicated the importance of vaccination or encouraged it. An urban woman stated: *"No one forced me or urged me to take the vaccine. No one asked me to come along to take it. Had someone urged me, I would have taken it. Neither the doctor nor family members urged me" (57 yr, SSI).* The lack of a mandate by the government for pandemic influenza vaccination was also indicated as a reason by some: *"The government did not carry out any promotional activities and there was no compulsion by the government to take the vaccine" (62 years, rural man, RM223).*

Other concerns

Four respondents expressed concerns about vaccine effectiveness; four indicated a general avoidance of medication, and one mentioned a fear of adverse reactions. No one indicated other concerns about the vaccine or type of administration as a reason for not having taken the vaccine.

Preference for injectable or nasal vaccine

Data indicate a strong preference for injectable over nasal vaccines. Twice as many respondents reported preference for an injectable vaccine and considered it safer (Table 4). Among those who considered a nasal vaccine safer, more were from the urban middle-income area, followed by the accessible rural area, the urban low resource and finally the rural remote area. When respondents were asked which vaccine they considered more powerful, 44.3% opted for the injectable and 32.6%

for the nasal. Those who reported no specific preference for either vaccine referred to (a) a sense of urgency in obtaining whichever vaccine was available, (b) prioritizing convenience and getting the vaccine that was most easily available, (c) the need to follow a doctor's advice and to not question what the doctor recommends, or (d) lack of their own opinion due to lack of experience with this new illness. Main themes that emerged from the narrative data of SSIs and IDIs in explaining preference for either the injectable vaccine or the nasal vaccine are described in the next section, with narratives quoted in Table 5.

Reasons for preferring an injectable vaccine

Injectable vaccine considered more powerful than nasal one

A commonly cited reason for preferring an injectable vaccine was that the vaccine would be directly absorbed in the blood and thus more effective. This account was frequently described in contrast to nasal vaccines, which were perceived as ineffective because they were likely to be expelled easily while breathing, and fail to reach all parts of the body. Ideas that injections work faster and had a longer duration of protection than nasal vaccines were also suggested to explain preferences. A few respondents said pain from an injection was an indication of its power.

Fear of side effects from a nasal vaccine

Many referred to fear of side effects from the nasal vaccine as a reason they preferred the injectable one. The numerous perceived side effects from nasal vaccines that were mentioned included irritation in the throat, burning sensation in the eyes, sneezing, pain in the nose, vomiting, breathlessness, a tingling sensation or numbness in the head, a bitter taste in the mouth and general discomfort. Others, who were unable to identify specific side effects, referred merely to being unable to tolerate a nasal vaccine.

Experience and familiarity with injections

Past experience and familiarity with injections compared to a relatively new nasal vaccine was another major reason for preferring injectable vaccines. Many respondents had an implicit trust in injections. Conversely, absence of familiarity and fear of relatively unknown nasal vaccines were frequently reported as reasons for preferring injectable vaccines.

Favourable attitude towards injections and preference regardless of perceived efficacy

A favourable attitude towards injections in general was observed and while this is linked to the theme of perceiving an injectable vaccine as powerful, it was qualitatively distinct in that injections were considered a panacea for all illnesses and the best form of administering any drug. A 65-year-old man explained: "Now suppose you want to take a vitamin supplement. You get it in the form of tablets, injections and liquid. But, of these, the injection spreads throughout the body" (urban SSI). On a similar note, a rural woman said: "Weakness reduces on administering the injection...one feels better after taking them" (47 yr, SSI). A few respondents reported preference for an injectable vaccine, despite their belief that nasal vaccines were more effective.

Reasons for preferring a nasal vaccine

Nasal vaccine considered more powerful than an injectable one

Those who preferred a nasal vaccine believed in the superior power of nasal vaccines to reach all parts of the body through one's breathing. Immediacy of effect was also noted. Administration through the nose was a perceived advantage because that was also the point of entry for germs causing swine flu. Some referred to physical sensations after receiving the vaccine as an indication of the vaccine doing its job. This was considered a desirable side effect of nasal vaccines. On a similar note, the idea that the nasal vaccine can spread to the brain was lauded as a measure of its powerfulness by a few who explained their preference for nasal vaccines. However, the same point was regarded as an adverse effect for those shunning the nasal vaccine.

Safety concerns for injectable vaccines and fear of needles

Some preferred a nasal vaccine due to concern about the safety of needles, which might have been previously used. This concern was noted only by urban respondents. Pain or swelling from an injection was a reason for preferring a nasal vaccine, but stated only by a few.

Discussion

Findings suggest trust in vaccines in general and for pandemic influenza vaccines in rural and urban communities of Pune district. A clear understanding of the rationale, however, of vaccines designed primarily for healthy individuals to prevent disease was lacking. Many respondents suggested no need for a pandemic influenza in the absence of fever or symptoms. A news report in Pune during the pandemic exemplifies the misconception. A young man suffering from symptoms of influenza who purchased a LAIV from a pharmacy and had it administered in a hospital subsequently died.³⁴ Some respondents thought vaccines were only relevant for children and irrelevant for adults. Data from rural Pune during and after the pandemic suggest that incidence of hospitalized H1N1 influenza was highest among 5-29 year olds.³⁵ Both the epidemiology and our findings suggest the need for promoting awareness of the public and health care providers of the value of vaccination for adults, and awareness of contraindications and precautions for vaccination.²¹

Awareness of the role of vaccines in preventing pandemic influenza was relatively low at 25%. A study in Bareilly, Uttar Pradesh, during the pandemic reported awareness of vaccines against swine flu among 47% of studied school students.³⁶ Notwithstanding low awareness in our study, most respondents, when asked about pandemic influenza vaccines, reported them as potentially helpful in preventing swine flu. Problems or side effects of the vaccine were mostly localized and seldom reported as a barrier to vaccine uptake. This is unlike studies from other countries^{9,10,37} or studies in India among health care workers^{38,39} where perceived side effects from the vaccine were reported as a deterrent to influenza vaccination intention. Although for the majority a vaccine with fewer side effects was preferred, the finding that for some, a localized reaction or physical sensation after vaccination was an indicator of vaccine efficacy and hence desirable, was unique to our study. It is also interesting to note that some considered an injection as less invasive than a nasal vaccine. It was said that "*one does not feel anything or one feels good*" after taking an injection, while nasal vaccines were perceived to have many more potential side effects. Fear of injections was noted by just a few and concerns about re-use of needles for injectable vaccines were reported largely in the urban middle-income area.

Study findings show a majority of the community preferred for injectable compared to nasal vaccines. Excessive, often unnecessary use of injections has been documented in India⁴⁰ and in other parts of Asia.^{41,42} The placebo effect offered by injections has provided an argument for widely using injections in India and is often demanded by patients. A study by Greenhalgh⁴³ in 1987 questioned blind faith in injections, and our findings suggest that these perceptions continue to hold true. While inactivated injectable vaccines are required for special groups, live-attenuated vaccines offer practical advantages for control of pandemics the general population in a country as highly populated as India. They are easier to administer and easier to produce larger quantities at lower cost.²⁰ Our findings suggest lack of community familiarity, rather than confidence, with this relatively new form of vaccine administration. Respondents from the urban middle-income area were more aware of nasal vaccines and more likely to consider them as the safer vaccine. Thus, gaining public support is not likely to pose a problem if implemented with effective communication and engagement. The success of the oral polio vaccine campaign in India demonstrates good prospects for widespread public acceptance of this new form of vaccine administration. Paterson and Larson recommend public engagement by building trust and learning about public concerns to be addressed,⁴⁴ and by communicating openly, honestly and proactively with the public and other stakeholders.⁴⁵ Our study identified the following key concepts that study communities attributed to the vaccine they preferred, either nasal or injectable, that should be well-understood and convincing, namely, the: ability of the vaccine to spread to all parts of the body and immediacy of effect. Properties of the vaccine itself – whether it was live attenuated or inactivated – were never mentioned spontaneously or questioned by any respondents. It is likely not a distinction of practical significance for respondents.

Findings suggest a blurring of urban-rural distinctions in the rapidly urbanizing Pune district. Notwithstanding highest awareness and vaccine uptake in the urban middle-income area, awareness of nasal influenza vaccines, belief in safety of nasal compared to injectable vaccines and use of pandemic influenza vaccine were reported by more respondents from the accessible rural area than from the low-resource urban area. The urban-rural dichotomy may be superseded by other factors with regard to vaccine policy and planning in such rapidly urbanizing settings⁴⁶ where people in accessible rural areas may have higher incomes and better access to information than persons in urban slums. More men than women had confidence in the power of nasal vaccines and anticipated no problems with pandemic influenza vaccines; yet they were also more likely to perceive a low risk for themselves in getting swine flu. Age-specific differences in awareness of nasal vaccines and in the ability of vaccines to prevent influenza indicate a need to inform older segments of the population.

The reported swine flu vaccine uptake rate was 8.3% in our study, but limitations in production and access may help explain the low figure. Vaccines were only available many months into the pandemic.^{47,48} There was no state-wide initiative for mass vaccination in Maharashtra although the Pune Municipal Corporation provided vaccines without charge to health care workers towards the end of the pandemic.⁴⁹ Furthermore, some hospitals and groups conducted their own vaccination camps. The nature of vaccine uptake varied. It was passive acceptance for some when the vaccine was made available in their neighbourhood, and active demand for others who made an effort to go and get it themselves.⁵⁰ The Indian Medical Association and Indian Academy of Pediatrics officially

recommended the pandemic influenza vaccine,⁵¹ but individuals had to purchase it privately. The public health dissemination strategy for communication information from the state about vaccine recommendations was unclear. The media played a major role in public communication, but this did not appear to be state-directed. Furthermore, the response to the pandemic by the state government seemed to focus on treatment with antivirals rather than preventive measures.

The influence of salience of the illness from personal experience with cases or deaths in the neighbourhood was a powerful motivator for vaccine uptake in our study. A similar finding was reported by SteelFisher et al¹⁰ in a study done in the United States of America (USA). A study using self-administered questionnaires among health care workers in Pune noted “self-protection against illness” as the main reason for accepting H1N1 influenza vaccination.⁵² Inasmuch as we surveyed community residents, we were able to identify additional practical reasons for vaccine acceptance, such as health system affiliation, health care provider recommendation, influence of peers and media impact.

A majority considered the illness as very serious or serious.³³ Nevertheless, some who acknowledged the seriousness did not consider themselves to be personally at risk. According to the health belief model, without perceived personal risk, considering an illness as serious may not translate into protective behaviour.⁵³ Gendered explanations of perceived personal risk were notable. Men regarded themselves as too strong to catch the illness (a ‘man of steel’ perception) and women considered themselves at reduced risk from being homebound. The above findings on low risk perception for oneself along with the belief that it was an urban but not a rural problem, suggest an optimism bias⁵⁴ where people consider themselves unlikely to catch an illness that they consider serious for others.

Access was a barrier because of community expectations that a vaccine, if relevant, would be delivered through a campaign in one’s neighbourhood. Such expectations may be a result of community experience with the vertical polio vaccination programme in India. A clear message from the government endorsing pandemic influenza vaccines, which the community indicated was lacking in the 2009 influenza pandemic, may promote vaccine uptake. Education of health care providers needs to ensure they make appropriate recommendations of vaccines. With respect to the SAGE Working Group framework of vaccine hesitancy,⁵⁵ our findings indicate that lack of confidence in pandemic influenza vaccines may not be a serious problem for uptake, but convenient access, complacency, and other sociocultural considerations take precedence.

Dissemination activities

The research team had planned community dissemination activities from the outset. After completing the field research and initial analysis, insights and information gained from the study were presented in meetings with urban and rural study communities. Urban and rural community members participated in meetings at their respective study sites, and a dissemination workshop was held in Pune for various levels of policy makers in November 2014. Officials from the central government, municipality and subdistricts participated. A brochure for community residents and a policy brief for policy makers was prepared, distributed and discussed at these events.

Strengths

The need and value in engaging the public in vaccination initiatives has been well-established.^{44,56,57} Recently documented challenges of introducing new vaccines in India,⁵⁸⁻⁶⁰ highlight the importance of studies that focus on understanding community perceptions, underlying issues and contextual influences that may influence vaccine acceptance. To the best of our knowledge, our study is the first to explore community views, preferences and uptake of pandemic influenza vaccination in India. One other study considered community perceptions of influenza during the pandemic in India,⁶¹ but was limited in its study of views of vaccines. Multiple methods used in our study – focus group discussions, semi-structured interviews and in-depth interviews – made triangulation of results possible. Quantitative survey findings indicated not only what the issues are but the relative frequency of particular perceptions and priorities; qualitative narrative data from SSIs helped explain what these ideas meant and IDIs enriched qualitative detail.

Limitations

The study was designed to provide relevant information and guidance in a local cultural context. Generalizations for other parts of the country must therefore be made with caution. The survey was cross-sectional, and community views and perceptions are subject to change over time and in response to other social or policy changes. Vaccine uptake was documented through self-report and the idea of a preventive vaccine was not clearly appreciated by some respondents. We did not confirm whether respondents who said they had taken a pandemic influenza vaccine actually did. By assuring participants that there were no right or wrong answers, assuring confidentiality, and presenting interviewers as independent researchers we attempted to minimize response bias. There is a possibility of recall bias since data collection for this study began two years after the officially declared end of the pandemic in 2010.⁶² Persisting media coverage of swine flu and consideration of vaccines, however, even during our data collection ensured a public memory of the illness and its control.

Conclusion

This study has elucidated cultural perceptions and ideas about the value of vaccines for pandemic influenza among urban and rural communities of Pune, India, which have practical implications for pandemic influenza control. In the 2009-2010 influenza pandemic, a community mass vaccination was not conducted in Pune. People had to pay the full price for a vaccine and display considerable initiative to obtain it. Our study examined reasons for use and non-use of influenza vaccines in this context largely through qualitative approaches. Policy implications from study findings highlight good prospects for use of influenza vaccines for pandemic control given community trust in vaccines. If a mass vaccination were to be planned for influenza control in the future, attention to the following recommendations may help enhance vaccination coverage: (1) Increase community awareness about influenza vaccines, (2) Emphasise their relevance for adults, (3) Emphasise risk for urban and rural communities, men and women, (4) Promote vaccination through health care providers, community leaders and government endorsement, (5) Deliver the vaccine right to communities at an affordable cost, (6) If nasal vaccines are considered, they need to be explained through effective communication addressing community concerns, (6) Plans should consider setting-specific differences within urban and rural areas. Questions about use of vaccines for control of seasonal influenza among high-risk

groups and the general population also require further consideration and study. This is especially relevant in the light of recent large outbreaks of H1N1 influenza,^{63,64} which is now considered a seasonal strain. Lack of priority for routine use of influenza vaccines at present⁶⁵ despite production capacity for influenza vaccines in India, suggests that reconsideration of policy, and sociocultural community studies are needed to guide further development of vaccine policy for effective action.

Methods

Study area

This study was conducted in Pune district, a focus of the 2009-2010 (H1N1) influenza pandemic in India. The district had a large number of cases and recorded the country's first death from H1N1 influenza in 2009. Study sites were selected in urban and rural areas. Two urban sites were low-resource densely populated (slum) settlements in Sangamwadi and middle-income neighbourhoods of Erandawane in Pune city. The rural sites comprised villages in Maval subdistrict that were more accessible to Pune city due to their location along a highway and more remote villages in Velhe subdistrict that were relatively difficult to access. Further details on setting are reported elsewhere.^{32,33}

Study design

A mixed-methods, cross-sectional and community-based study was conducted in urban and rural areas of Pune district. The present analysis focuses on community awareness, preference and use of vaccines to prevent pandemic influenza, and primarily had a qualitative focus. We employed multiple methods including focus group discussions, cultural epidemiological semi-structured interviews integrating qualitative and quantitative data, and qualitative in-depth interviews. Formative focus group discussions (FGDs) provided insight on the setting and guided development of questions and categories of semi-structured interviews (SSIs). SSIs were developed based on the explanatory model interview catalogue (EMIC)⁶⁶ framework for cultural epidemiology⁶⁷ to obtain representative distributions of perceptions of pandemic influenza and the role of vaccines. Additional in-depth interviews (IDIs) were conducted to gain a deeper understanding of experiences and motivations of those who took the pandemic H1N1 influenza vaccine, and the views, potential barriers or hesitation among those who did not do so.

Instruments and respondent selection

Inclusion criteria for FGDs, SSIs and IDIs were resident adults (18-65 years) in the community with conversational fluency in Marathi and ability to mentally and physically withstand the interview or discussion.

Respondents for SSIs were randomly selected from voters' lists for each of the study areas.³³ Voters' lists, which were the most comprehensive of available records, were obtained for each of the study areas. One hundred and ten households were randomly selected for each area using a random number generator. To avoid selection bias inherent to use of voters' lists, selected households were located but not interviewed. The neighbouring household to the right was approached for interview instead. If no member of the household satisfied the inclusion criteria or if there were no willing participants, the adjacent household to the right was approached, until a suitable respondent was

found. An equal balance of men and women and younger (18-45 years) and older (46-65 years) age groups was maintained. Questions related to awareness, preferences, uptake of pandemic influenza vaccines and barriers to vaccine use were considered for this report. Quantifiable coded responses were collected and any quantitative data presented in this report came from the analysis of SSIs. Specific questions that the coded responses correspond to have been included as footnotes to the tables. Narratives in response to open questions in the SSIs complement the quantitative data. IDIs were conducted with a purposively-selected subsample from the SSIs. The IDIs provided accounts enriched by context and reasons for vaccine use or non-use. FGDs were conducted in urban and rural study areas based on a convenience sample recruited by community leaders or community health volunteers. The FGD agenda covered similar broad topics on ideas about vaccines including perceived benefits, problems and use of pandemic influenza vaccines.

We designed instruments for all three methods during several workshops based on a literature review and previous work on vaccine acceptance.⁶⁸⁻⁷⁰ Instruments were revised based on feedback from other experts and public health professionals. Instruments were pilot tested and further revised after translation into Marathi.

Data collection

Research assistants conducting the SSIs had Masters-level qualifications in social sciences, were native Marathi speakers and received training in interview skills and data management. They worked in pairs with one person conducting the interview and the other maintaining data records. SSIs lasted for 45 minutes on average. Data sheets were checked for accuracy and discrepancies resolved while in the field.

FGDs and IDIs were conducted by one of two bi-lingual senior researchers with doctoral and masters-level degrees in social sciences, accompanied by a note taker. The average duration of FGDs was 1 hour and IDIs was 40 minutes. Facilitators and note takers discussed impressions and compared notes after each FGD and IDI.

Interviewer and respondent characteristics were matched where possible. For example, a female facilitator conducted focus groups with women. Researchers did not have a prior relationship with study participants. All interviews and discussion were conducted in Marathi. FGDs, SSIs and IDIs were audio recorded with participants' consent.

Data management and approach to analysis

Qualitative analysis

Narrative data from SSIs were first entered in a word processor in Marathi and then translated into English. Supervisors regularly checked transcriptions and translations for quality. FGD and IDI transcripts were translated into English and entered in a word processor on an ongoing basis while constantly monitoring data quality with reference to study objectives.

FGDs, narrative data from SSIs and IDI data were imported into MAXQDA v.11 (VERBI Software, Germany) for data management and analysis. Analysis was rooted in the objectives of this paper. Thematic coding was done using a deductive approach for first-level coding. Inductive coding was

used for secondary and tertiary level codes. Qualitative data collected from the three different methods were regarded as complementary in this analytic process of triangulation.

Quantitative analysis

Quantitative data from SSIs were entered by the interview team into Epi Info v. 3.5.3 (CDC, USA). For double-entry verification, a second entry of quantitative data was done independently by a member of another team. Questions that required affirmation or negation were coded on a four point Likert scale, ranging from a clear yes or no (values of 3 or 0), to a qualified yes or no (values of 2 or 1) for responses. Variables with few qualified responses were dichotomised for analysis. To assess the influence of gender, area of residence and age on views and vaccine uptake, systematic comparisons were analysed for age group, sex and study area. Significant differences at the 0.05 level have been presented in this paper, using Fisher's exact test to compare proportions across different groups. Quantitative variables were also imported into MAXQDA to review narratives of interest based on quantitative associations, thus facilitating integrated analysis of quantitative and qualitative data. Data analysis was done with STATA v. 12.1 (StataCorp, USA) and SAS v. 9.3 (SAS Institute Inc., USA).

Ethical considerations

The Institutional Ethics Committee of the Maharashtra Association of Anthropological Sciences, Pune, the Ethics Commission of Basel and the WHO Research Ethics Review Committee provided ethical approval for this study. Written informed consent was obtained prior to conduct of interviews and FGDs. No financial or other incentives were provided to participants.

Conflict of interest:

The authors have no competing interests to declare.

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Table 1. Summary of sample characteristics

	Number of participants		
	Focus group discussion (FGD) ^a , n=28	Semi-structured interview (SSI), n=436	In-depth interview (IDI), n=12
Age^b			
18-25	5	76	1
26-35	5	85	5
36-45	5	62	2
46-55	4	119	1
56-65	3	94	3
Sex			
Female	13	221	10
Male	15	215	2
Site			
Urban	10	215	6
Rural	18	221	6
Area			
Urban middle-income	5	102	5
Urban low-resource	5	113	1
Rural more accessible	6	113	6
Rural less accessible	12	108	0

^a Five focus groups were conducted, each with 5-6 participants. Two focus groups were conducted with women, two with men and one with both men and women.

^b Specific ages for one focus group with 6 participants at the rural site were not collected. Hence, the total number of participants categorized by age for the focus groups does not add up to 28.

Table 2. Awareness, health care provider recommendation and use of pandemic influenza vaccines

	Overall (%)	Age group (%) ^a			Area of residence (%)					Sex (%)		
		Younger	Older	P value ^b	Urban middle-income	Urban low-resource	Rural more accessible	Rural less accessible	P value ^b	Female	Male	P value ^b
	n = 436	n = 223	n = 213		n = 102	n = 113	n = 113	n = 108		n = 221	n = 215	
<i>Awareness of vaccines to prevent swine flu</i>												
Nasal vaccine ^c	26.6	31.4	21.6	*	47.1	25.7	26.6	8.3	***	25.8	27.4	
Injectable vaccine ^d	23.4	26.0	20.7		28.4	26.6	17.7	21.3		21.7	25.1	
<i>Recommendation by health care provider</i>												
To take a swine flu vaccine ^e	15.8	20.6	10.8	**	23.5	20.4	13.3	6.5	**	13.1	18.6	
<i>Uptake of swine flu vaccine</i>												
Personal use ^f	8.3	9.4	7.0		13.7	6.2	9.7	3.7	*	5.9	10.7	
Others in household ^g	10.6	NA	NA		19.6	7.1	14.2	1.9	***	NA	NA	

^a Younger age group: 18-45 years, Older age group: 46-65 years; NA: Not applicable

^b Fisher's exact test was used to compare proportions across age groups, area of residence and sex:

*p≤0.05, **p≤0.01, ***p≤0.001

^c Frequency of affirmative responses to the question: "Has your health care provider ever recommended your taking a vaccine to protect against swine flu?"

^d Frequency of affirmative responses to the question: "Have you ever taken a vaccine to prevent swine flu?"

^e Frequency of affirmative responses to the question: "Has anyone else in your household ever taken a vaccine to prevent swine flu?"

All questions were enquired in the local language, Marathi, and translations have been provided here.

Table 3. Reasons for non-use of pandemic influenza vaccines

Reasons for not taking the pandemic influenza vaccine (personally or for someone in the household) ^a	Overall	Area of residence (%)					Sex (%)		
	I (%)		Urban	Urban	Rural	Rural			P
		Urban	low-	more	less	P	Female	Male	value
	n = 436	n = 102	n = 113	n = 113	n = 108	value ^b	n = 221	n = 215	
Low risk attributed to influenza	55.0	46.1	57.5	60.2	55.6		49.8	60.5	*
Sufficient precautionary measures already taken	15.8	29.4	25.7	6.2	2.8	***	15.8	15.8	
Access (where and how to get it)	14.7	7.8	9.7	17.7	23.1	**	11.8	17.7	
Unaware of vaccine	11.7	2.0	13.3	12.4	18.5	***	12.7	10.7	
Cost of vaccine	5.0	4.9	8.0	3.5	3.7		5.9	4.2	

^a Response to the question: "For you or anyone in your household who did not take the vaccine for swine flu, were there any particular reasons not to take it? Can you explain why some (or all) did not take it?" were coded into categories described in the table. Multiple categories could have been mentioned and coded for each respondent. 7.3% of respondents did not provide a reason. Categories reported by less than 5% are not presented. They included: lack of encouragement by health care provider (3.9%), other miscellaneous (3.4%), vaccine shortage due to high demand (2.1%), no time to take the vaccine (1.6%), doubts about vaccine effectiveness (0.9%), and general avoidance of medication (0.9%).

^b Fisher's exact test was used to compare proportions across area of residence and sex: * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$. No differences were observed across age groups and they have hence not been presented.

Table 4. Preference for injectable or nasal pandemic influenza vaccine

	Overall	Age group			Area of residence					Sex		
		Young er	Old er	p valu e ^a	Urba n- middl e inco me	Urban low- resour ce	Rural more accessi ble	Rural less accessi ble	p valu e ^a	Fema le	Mal e	p valu e ^a
	n = 436	n = 223	n = 213		n = 102	n = 113	n = 113	n = 108		n = 221	n = 215	
More powerful vaccine (%)^b												
Neither	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Both equal	3.0	2.7	3.3		2.9	3.5	1.8	3.7		3.6	2.3	
Injection	44.3	44.4	44.1		42.2	51.3	40.7	42.6		45.2	43.3	
Nasal spray	32.6	36.3	28.6		33.3	31.0	37.2	28.7		26.2	39.1	**
Cannot say	20.2	16.6	23.9		21.6	14.2	20.4	25.0		24.9	15.3	*
Safer vaccine (%)^c												
Neither	0.7	0.5	0.9		0.0	0.9	0.0	1.9		0.9	0.5	
Both equal	9.6	11.7	7.5		9.8	5.3	14.2	9.3		12.2	7.0	
Injection	57.1	54.7	59.6		46.1	64.6	54.9	62.0	*	55.2	59.1	
Nasal spray	27.5	29.6	25.4		42.2	24.8	25.7	18.5	**	25.8	29.3	
Cannot say	5.0	3.6	6.6		2.0	4.4	5.3	8.3		5.9	4.2	
Personal preference (%)^d												
No preference	11.2	8.1	14.6	*	9.8	6.2	10.6	18.5	*	12.7	9.8	
Injection	58.5	59.2	57.8		52.9	65.5	54.9	60.2		59.3	57.7	
Nasal spray	30.3	32.7	27.7		37.3	34.5	28.3	21.3		28.1	32.6	

^a Fisher's exact test was used to compare proportions across age groups, area of residence and sex, *p≤0.05, **p≤0.01, ***p≤0.001

^b Frequency of responses to the question: "Do you think either of these vaccines (the nasal spray or the injection) would be more powerful and better able to protect you against swine flu? ... Why?"

^c Frequency of responses to the question: "Which one of these vaccines (nasal spray or injection) do you think would be safer for you? ... Why?"

^d Frequency of responses to the question: "If you could choose either of these vaccines to protect yourself against swine flu, which one would you prefer, the nasal spray or the injection? ... Why?" All questions were enquired in the local language, Marathi, and translations have been provided here.

Table 5. Reasons for preferring an injectable vaccine or a nasal vaccine for pandemic influenza

A) Reasons for preferring an injectable vaccine	
<i>Theme</i>	<i>Illustrative quote</i>
Perceived powerfulness of vaccine	
Injectable vaccine spreads through the body from absorption in the blood	<i>"In our village it is believed that the medicine reaches the whole body only through an injection" (29 yr, rural woman)</i>
Injectable vaccine spreads faster in the body	<i>"An injectable vaccine spreads all over quickly. The nasal one takes time while the injection spreads faster" (23 yr, urban man)</i>
Injectable vaccine has longer lasting effects	<i>"Injectable vaccine because its effect will last for long" (31 yr, rural man)</i>
Nasal vaccine may be expelled while breathing, sneezing or in mucus	<i>"The injectable vaccine allows the medicine to disperse internally. The medicine if administered through the nasal route will get expelled through breath. It won't go inside" (64 yr, rural man)</i>
Nasal vaccine may not reach all parts of the body	<i>"Injectable vaccine is better because the nasal vaccine will travel with the breath and only reach the lungs while the injectable one will circulate through the blood in the entire body" (60 yr, rural man)</i>
Pain caused by injectable vaccine is an indication of its powerfulness	<i>"Actually, pain at the injection site is considered as good sign" (rural woman, FGD)</i>
Side effects or safety concerns of alternative	
Fear of numerous side effects from nasal vaccine	<i>"If given in the nose then it creates irritation in the throat, and the whole mouth becomes bitter" (46 yr, rural woman)</i>
Familiarity and trust	
Past experience and familiarity with injections	<i>"I will prefer the injectable vaccine since we are used to taking injections. We have never taken it through the nose" (27 yr, urban man)</i>
Implicit trust in injections	<i>"Injection- all I can understand is that, it will be effective when we take it" (50 yr, woman)</i>
Fear of relatively unknown nasal vaccine	<i>"A person fears taking it through the nose. There is no fear in an injection. I fear the nasal one" (48 yr, rural woman)</i>
B) Reasons for preferring a nasal vaccine	
<i>Theme</i>	<i>Illustrative quote</i>
Perceived powerfulness of vaccine	
Nasal vaccine can reach all parts of the body through breath	<i>"[I prefer] nasal as when we breathe it reaches the whole body. Injection does not affect the body so fast" (59 years, urban woman)</i>
Nasal vaccine has a more immediate effect	<i>"Will take it through the nose. It will have an immediate effect" (50 yr, rural woman)</i>
Nasal vaccine is administered through the nose where germs enter	<i>"Nasal [is preferred] because we would have the disease through there...Its effect would be more than injectable" (21 yr, rural man)</i>
Nasal vaccine has desirable side effects indicative of vaccine doing its job	<i>"Nasal administration must cause tingling and stinging....You don't feel anything after taking the injectable vaccine but you can feel the medicine going inside and also the stinging caused when administered through the nose" (47 yr, rural man)</i>
Side effects or safety concerns of alternative	
Fear of needles or pain caused by injectable vaccines	<i>"The nasal one is better. With an injection, there is inflammation or pain later" (57 yr, urban man)</i>
Concerns regarding potential re-use of needles in injectable vaccines	<i>"There is a risk associated with the injection because an already used syringe may be used again, unlike in case of a nasal vaccine which I think spreads in the entire body in the vapour form" (65 yr, urban man)</i>

Table 5(A) lists main themes and illustrative quotes distilled from respondent narratives regarding why an injectable vaccine was preferred over a nasal one. Narratives from focus group discussions and open questions in semi-structured interviews were analysed thematically grouped under broad domains of perceived powerfulness (or efficacy), side effects or safety concerns and familiarity, trust. Explanations provided were either perceived advantages of the injectable vaccine (text in black) or perceived disadvantages of the nasal vaccine (text in red). Similarly, in Table 5(B), explanations for preference of the nasal vaccine were due to either perceived benefits of the nasal vaccine (text in black) or perceived disadvantages of the injectable vaccine (text in red).